

126 Mr. Brett, *On the Specular Reflexion Hypothesis*, XXXVII. 3,
of the *Memoirs*, in my paper giving observations with the
2-foot.

I conclude with remarking that Professor Struve's unfavourable impression may perhaps in some degree have arisen from his visit to Malta having been made at a time of the year when the atmosphere is occasionally much disturbed by storms, which are of course greatly to the disadvantage of a very large telescope.

Ray Lodge, Maidenhead,
1877, January 23.

The Specular Reflexion Hypothesis, and its bearing on the Transit of Venus. By John Brett.

There was a phenomenon observed at the transit of *Venus* (the ring of light at the planet's limb), which, as far as I know, has not hitherto been explained, and my present purpose is to show that the specular reflexion hypothesis has an important bearing on this subject. If, in addition to a burnished reflecting surface, we suppose *Venus* to have a translucent envelope of great density, it appears to me that all the elements necessary for a complete explanation of the mystery are at hand; at all events, it is possible on these terms to produce a very similar phenomenon experimentally.

In my last I ventured to suggest a reason for believing the surface of the planet to be in a molten or vitrified state.

That suggestion was peculiarly fortunate in having attracted the attention of Mr. Christie, whose investigations afford, at all events, invaluable data for studying the subject, if not (as I believe) a complete confirmation of the hypothesis. *Vide* last Number of the *Monthly Notices*.

The theory of specular reflexion is, of course, perfectly well understood, and its phenomena in the case of *Venus* and the Sun would occur as follow:—At superior conjunction we should see merely a small circular image of the Sun. In the course of the planet's progress in its orbit, this image would move in longitude and extend itself in latitude, assuming a cusped crescent form. Near the time of inferior conjunction it would approach the limb, and present an extremely attenuated rim of light. At transit this rim would completely encircle the disk, and theoretically would never entirely disappear. Even practically, the Sun's light near his limb is so much weaker than at the centre, that it is quite conceivable that the ring, or reflected image, might be observed during the earliest and latest stages of the transit. The position this ring would occupy within the planet's limb can of course be determined with accuracy by a calculation based on the relative diameters of the Sun and planet.

So far the theory is simple, and has been so well understood for ages that no illustration is needed.

It will, however, be perceived that any expansion in latitude of this extremely attenuated ring which might have been ob-

served at transit (and I understand that the photographs prove such to have been the case), would introduce other and more complicated considerations into the problem, indicating, as I suppose it would, the existence of a refractive envelope or atmosphere. Now, any diffusion or extension of the area of the ring would of course weaken the intensity of its light, not to mention the question of absorption. Before contact, however, these considerations would not at all damage the theory. The great difficulty arises when we find a diffused ring of light surrounding the planet whilst actually on the Sun's disk surpassing in brilliancy his direct rays. If there are no theoretical objections to the planet's surface existing in a state of fusion, or at all events, to have so existed, it is not unreasonable to suppose that the metallic constituents of its substance would settle at a lower level than its lighter or vitreous elements: we might thus imagine a molten metallic lustrous surface overlaid and protected by an envelope of glass.

There is, I suppose, no doubt that the lenticular action of an atmosphere of great refractive power would be effective to bend over the limb, and produce in a condensed state, some of the rays which impinge on the planet immediately *beyond* the limb, and in that way it seems to me that a certain degree of increased brilliancy would be produced; but if we are allowed to assume the existence of a vitreous envelope, it is evident that, in addition to the correction of the divergence of such rays as have been reflected from a zone of the burnished surface *immediately* behind the limb, a quantity of light reflected from another zone still further beyond the limb, would be condensed by *interior* reflexion from the surface of the vitreous envelope, acting in the sense of a concave mirror, and produced over the limb towards the Earth, so as to give a luminous halo of greater brilliancy than the Sun itself. The little instrument which I invite the Fellows to look into after the meeting shows that such a result can be experimentally produced.

It consists, first, of a small globe representing *Venus* suspended within a tube; secondly, of a collimator; and, thirdly, of a microscope focussed upon the limb of the little globe. The little globe or model of *Venus* consists of a glass bulb filled with mercury.

When this instrument is directed to a gas-lamp the ring of condensed light is very plainly seen; and I think that although the apparatus is very rudely and imperfectly made, it does all that can be expected of it.

I now ask leave to add one more suggestion, as follows:—

At the next transit it would be worth while for some one with a good telescope and a Dawes-diaphragm to look at the centre of *Venus's* disk for the reflected image of the Earth. If the envelope of the planet has great refractive power, I think it not improbable that it might be seen as a minute nebulous speck of light.

38 Harley Street, London,
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